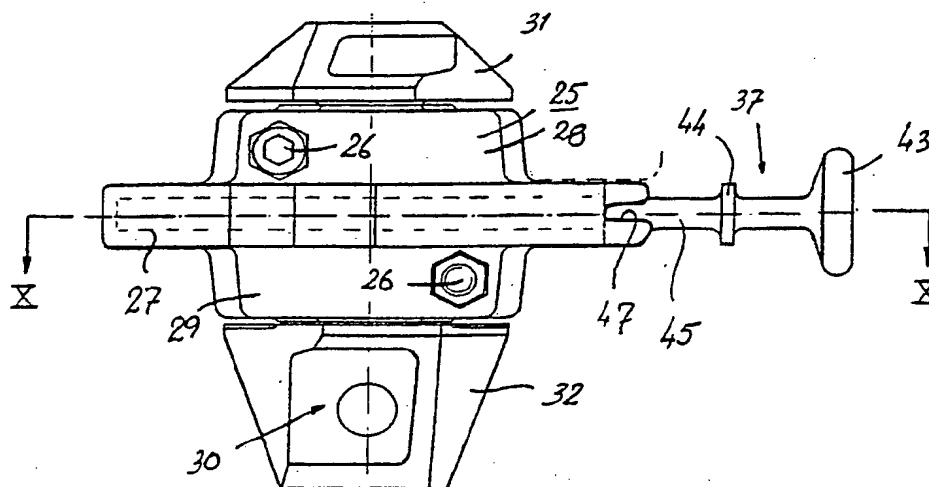




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(54) Title: SEMI-AUTOMATIC TWIST-LOCK, IN PARTICULAR FOR THE COUPLING TOGETHER OF CONTAINERS

**(57) Abstract**

Twist-lock for coupling together objects, e.g. a number of containers placed one above the other, which in known manner are provided with corner boxes with holes for such twist-locks, said twist-lock consisting of the housing (25) with a turnable locking unit (30) with a locking cone (31, 32) protruding in each direction, one of said locking cones (31) being designed for primary, firm connection to a corner box in an object, e.g. a container, while the opposite locking cone (32) is designed for automatically locking connection, by axial displacement and turning, to a corner box in another object of a pair of objects, the turnable locking cone having a head (32) which is both conical and twisted as well as spring-loaded (33) in the direction towards the locking position, as a result of which it is turned, when pressed against the hole in the corner box, so that it can pass the hole and, having been passed through the hole in the corner box, automatically assumes a locking position turned in relation to the hole, whereby the locking unit (30) is arranged in such a way as to be capable of positive turning and securing, by means of slots (47) in housing (25), in the release position with the aid of a protruding, flexible handle (37) connected to a non-central part of locking unit (30).

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Semi-automatic twist-lock,
in particular for the coupling together of containers

This invention relates generally to a torsional lock, commonly referred to as a "twist-lock", for coupling together objects of the type provided at two corresponding locations with coupling holes, e.g. corner boxes with coupling holes of ISO standard type for containers appropriate for the twist-lock, as a result of which the twist-lock joins, in the locked position, the object in an immovable manner. Twist-locks of the type in question are specially designed for coupling together containers and will in the following be described mainly in connection therewith, even though it is obvious that the twist-lock can be used for coupling together many other types of object.

A twist-lock consists normally of a twist-lock housing with two plane and parallel sides arranged to abut plane surfaces of the locking corners or the corner boxes in a container as well as of a twist-lock pin passing through the housing with two normally cone-shaped heads arranged so as to be capable of being introduced into the lock holes of the corner boxes and after turning secured in this locking position whereby the two containers are coupled together in an immovable manner. Such coupling together takes place preferably between containers vertically stacked above one another in order to eliminate the risk of the containers being displaced, during transportation, sideways in relation to one another or possibly being released from one another in the upward direction.

A known type of twist-lock is designed with a symmetrical through-going double locking cone for simultaneous locking at two corresponding locking corners of two containers. When coupling together containers the twist-lock is inserted with one of its locking cones down into the hole in the locking corner of a lower container, whereupon an upper container is lowered with one lock hole over the upward protruding locking cone. This twist-lock has inter alia the disadvantage that it can be pushed off if the upright protruding locking cone happens to be pushed sideways as the upper container is fitted over the twist-lock. Nor is it possible to preassemble this type of twist-lock in a bottom corner box of an upper container for subsequent lowering of said container and fitting of the locking cone projecting downward into a lower container since the twist-lock cannot

be locked in the bottom corner box without dropping out.

In order to remedy at least the first-named disadvantage another type of twist-lock has been designed on one of its sides with a twist-hook secured in the housing and on its other side with a turnable locking cone, whereby the secured twist-hook can be fixed in the corner box of a first container so that there is no danger of the twist-lock becoming loose if the other container while moving towards the first container happens to knock against the upward projecting twist cone. This type of twist-lock must not be mounted either in the bottom of a container so as to face downward since it can turn and become loose while the container is being handled, which may cause injury to the handling personnel.

When stacking several containers vertically above one another it may be difficult and hazardous to mount a twist-lock on top of the container which happens to be uppermost, and it has therefore been a requirement to be able to mount a twist-lock in the bottom of a container which is to be raised and located on top of an already present container. This can be done easily and conveniently if the container is lifted slightly. However, this handling operation presupposes on the one hand that the twist-lock is efficiently secured in the corner box of the container so that it cannot inadvertently become loose and drop out whatever the situation, and on the other hand also that the downward-protruding locking cone in the twist-lock can be guided simply and efficiently and preferably in an automatic manner into the corner box on top of the container below and locked therein.

The invention is accordingly intended to solve the problem by providing a twist-lock which can be safely and efficiently mounted in downward facing manner in the bottom corner boxes of an object, e.g. a container, as well as upward facing in the top corner boxes of a container; which having been introduced into the corner box of a container located beneath and being in said corner box automatically causes locking of the downward facing locking cone; which cannot be inadvertently loosened either from the upper or from the lower container; which comprises means for manually releasing the twist-lock from the two containers coupled together; and which has means for indicating the locked or open position, respectively, at least at the turnable locking cone of the twist-lock.

This is achieved with the aid of a twist-lock for coupling together objects, e.g. a number of containers placed vertically one above the other, which are provided in known manner with corner boxes with holes for such twist-locks, the twist-lock consisting of a housing with either a locking knob firmly arranged in the housing for connection to a corner box in an object, e.g. a container, and, with a turnable locking cone at the opposite end for connection to a corner box in another object of a pair of objects, or with a through-going locking cone unit with a bottom cone and a top cone.

The turnable locking cone or one of the turnable locking cones is spring-loaded in the direction towards the locking position so that after insertion through the hole of the corner box it automatically assumes a locking position turned in relation to the hole, while being so arranged, with a view to releasing and removal of the twist-lock from the corner box, that it can be positively acted upon by an operating handle or similar device, which also serves by way of indicator for the position of the turnable locking cone in relation to the fixed locking knob.

More precise characteristics and advantages of the invention will appear from the following detailed description in which reference is made to the attached drawings.

In the drawings Figure 1 shows a perspective view obliquely from below of a first embodiment of a twist-lock according to the invention. Figure 2 shows the same twist-lock seen from the side, Figure 3 shows in the same manner a side view of the twist-lock along arrow III in Figure 2 and Figure 4 shows the twist-lock of Figure 2 seen from below. Figure 5 is a section along the line V-V in Figure 2. Figure 6 is a view of the twist-lock from above, and Figure 7 is a section along the line VII-VII in Figure 3. Figure 8 illustrates in a sequence of four Figures A, B, C and D the method of using the twist-lock according to the invention. Figure 9 shows a side view of another embodiment of the invention, Figure 10 shows a section along the line X-X in Figure 9, and Figure 11 shows the twist-lock of Figure 9 as seen from above. Figure 12 illustrates schematically the method for releasing a twist-lock according to the invention as shown in the Figures 9-11 with the aid of a tool designed for that purpose.

The twist-lock shown in Figures 1-7 consists generally of a housing 1 with a locking knob 2 firmly arranged in the housing, a turnable locking cone 3 and a handle 4 for operating the turnable locking cone 3.

5 The housing 1 is suitably subdivided into two halves capable of being screwed together as indicated in Figure 1, and it consists of a support plate 5 with two parallel sides arranged so as to abut a plane side of each of its corner boxes in a container as indicated in Figure 8. These corner boxes, which are normally of so-called ISO standard
10 type, are designed with substantially rectangular lock holes, in which the locking knob 2 or locking cone 3, respectively, is so arranged that it can be inserted and locked by turning in relation to the lock hole.

From the one side of the support plate, in the illustrated case
15 the upper side, protrudes locking knob 2, which is designed with a shaft section 6 which enables turning of the locking knob in relation to the lock hole in the corner box of the container and with a flange section 7, the flanges of which are intended to engage behind the rectangular sides of the lock hole and to secure the locking knob
20 against axial displacement in the corner box. In order to prevent inadvertent turning of the housing with the locking knob when the latter is in the inserted and turned position within the hole of the corner box, a locking pin 8 is provided, which is shown inter alia in Figure 3 and which is spring-loaded in the upward direction at the
25 chamfered part 9 of the locking knob forming the shaft section proper. The locking pin accordingly snaps in between the chamfered part 9 of the locking knob and the edges of the rectangular lock in the corner box thus preventing, when the locking knob is inserted and locked in the corner box, turning of the housing 1 with locking knob 2 in
30 relation to the corner box.

On its other side support plate 5 has a neck 10 which partly constitutes a spacer sleeve corresponding to the thickness of the material in the corner box of the container, and partly constitutes a guide for shaft 11 of the turnable locking cone 3. At its inner end
35 shaft 11 of the locking cone is so designed as to comprise a flange 12 accommodated in a corresponding recess 13 of the housing and maintaining locking cone 3 within the housing in an axially immovable but

turnable manner. Within flange 12 the shaft is provided with a herringbone tooth 14 which co-operates with a corresponding herringbone tooth 15 in the inner end of operating handle 4. Operating handle 4 is also located in the housing and retained in the latter by herringbone tooth 15 abutting a shoulder 16 in the housing. With the aid of the herringbone teeth 14 and 15 locking cone 3 is turned whenever handle 4 is turned.

In order to bring about automatic locking of locking cone 3 by insertion into the hole of a corner box of a container, the conical head 17, as is most clearly apparent in Figure 1, is partly conical and partly also twisted or designed with oblique contact faces 17a, which when pressed against the edges of the corner box hole cause positive turning of the conical head 17, as a result of which the latter turns so as to correspond with said hole, enabling the conical head to be inserted into the corner box. The obliqueness of contact faces 17a shall preferably be orientated in such a direction that the twist-lock, when lowered into a corner box, tends to turn in the same direction as during insertion and locking of the fixed locking knob 2, so that the locking pin 8 is not subjected to any force when the twist-lock with the turnable cone is pressed down into a corner box.

It is intended for the conical head to return, after passing through the hole in the corner box, into the locking position illustrated in Figures 1 and 4 as soon as it has passed the edges of the hole, and to this end a section not provided with teeth of the innermost end is provided with a lug 18, most clearly shown in Figure 5 and which co-operates with a leafspring 19 inserted into a hole 20 in the housing and locked against stop 21 in the hole. Spring 19 is designed in such a way that lug 18 is located at such a point that the turnable cone 3 is normally moved into its locking position as shown in Figures 1 and 4, as soon as it has snapped into the hole of the corner box, and whereby lug 18 rests against an outer part of leafspring 19 and the edge of hole 20 as shown in Figure 5.

The operating handle 4 is suitably arranged in such a position as to extend, in the locking position of the turnable cone, parallel with support plate 5. In addition, the spring 19 is to be designed in such a way as to enable the conical head 17 to be positively locked in the "opening position", whereby it can be withdrawn from the corner box of the container. This is brought about by turning the operating

handle 4 in such a way that lug 18 is displaced from its end position on the left as shown in Figure 5 to its end position on the right (not shown) where the lug is between an end of the spring and the right-hand edge of the hole. An appropriate turning angle for locking conical head 17 amounts to about $+45^\circ$, and an appropriate angle for positive opening of the conical head may be about -15° measured from an O-line 21 as indicated in Figure 5. To this end the rotatable locking cone is chamfered at two edges so that it can be turned to said negative angle without the conical head locking the cone in the direction opposite to ordinary locking in the corner box.

The operating handle also serves as an indicating device for the position of the locking cone, inasmuch as it is turned downward as shown by the dashed lines in Figure 2 when the conical head 17 is turned as it passes the edges of the hole in the corner box, or remains in the turned-down position when cone 17 is positively "opened".

The application of the arrangement described is illustrated in Figure 8, A, B, C and D.

Figure A shows how the container 22 is raised slightly while an operator is about to insert and lock a twist-lock 23 in a bottom corner box 24 of the container. This is done by fitting in twist-lock 1 with the fixed locking knob 2 facing upward in such a way that the locking knob can be inserted into the hole in corner box 24. Thereafter the entire lock is turned back until its front side with the operating handle 4 is parallel with the end side of corner box 24. At the last stage of said turning locking pin 8 drops in between an edge of flange 12 of the locking knob 2 and an edge in the hole of corner box 24 and prevents any turning of the twist-lock until its locking pin 8 is released in conjunction with the removal of the twist-lock after it has accomplished its purpose.

Figure B shows how the twist-lock is turned in its normal and locked application position, in which operating handle 4 is parallel with the end side of the corner box and the turnable locking cone 3 is in its normal locking position at an angle of about 45° in respect of the parallel sides of the rectangular holes in the corner boxes.

In Figure C container 22 has been lowered to the point at which the conical head 17 is just entering the hole in corner box 24, whereby the conical head 17 is positively turned against the action of spring 19 (see Figure 5). As the conical head 17 is turned, operating handle 4 is also turned downward, and this serves to indicate that the conical head 17 is not in the locking position.

Once the conical head has passed the edges of the hole in the corner box, spring 19 forces the head back into its locking position within the edges of the hole, when it is turned by about 45°, and this, as shown in Figure D, is indicated by the fact that the operating handle is raised to its horizontal position.

The twist-lock is released by causing handle 4 to swivel downward to the end position in which lug 18 is locked in its "opening position" (on the right in Figure 5), whereby the upper container with the twist-lock can be lifted from the lower container. Once the container has been lowered to a handling position which is appropriate for the handling personnel, locking pin 8 is released and the lock is turned and withdrawn from the bottom hole of the upper container.

Figures 9-12 show an alternative embodiment of the invention differing from the above twist-lock mainly in that the twist-lock is provided with a different locking cone operating device. This latter embodiment consists of a housing 25 in the form of two halves 25a and 25b joined together with the aid of screws 26, the housing on either side of support plate 27 forming a neck 28 or 29, respectively, of substantially the same shape and size as the hole in the corner box. In this case the housing accommodates a through-going locking unit 30 with a "straight" top cone 31 for manual connection to the bottom corner box of an upper container and a "twisted" bottom cone 32 for automatic connection and locking in a top corner box of an adjacent upper container. The housing has on the inside a cavity accommodating a multi-bladed, double-acting, substantially U-shaped spring 33, said spring with its almost Omega-shaped main section being secured in housing slot 34, while its legs extend towards the through-shaft 35 of locking unit 30. At the level of the spring the shaft is provided with a lug 36 facing the main section of spring 33 and arranged in such a position on the shaft that in the normal position when they are not actuated the two locking cones 31 and 32 assume a locking position owing to the action of spring 33 on lug 36.

To enable active release of the locking cones from the locking position the twist-lock is designed with a flexible handle 24 extending through a hole 38 in the housing, which via a flexible wire 39 with a fastening screw 40 arranged at the end and with a wire lock 41 is connected to a fastening pin 42 on shaft 35 of the locking unit, which in the non-actuated state extends in a substantially right angle in respect of housing hole 38. The flexible grip 37 consists of an outer gripping section 43, a stop flange 44 arranged near the gripping section and a shaft section 45 with a stop lug 46.

5 Shaft 45 is so arranged as to be guided, in the non-actuated locking position of the twist-lock within housing hole 38. The outer end of hole 38 has two slots 34 and 48, the width of which is the same or slightly larger than the thickness of wire 39, these slots extending each in its own direction from the hole in the body of support

10 plate 27 while forming an angle of about 45° with the longitudinal axis of the hole 38. The slots 47, 48 are intended to serve as a stop for stop lug 46 of the handle when bottom cone 32 is released from the top corner box of the lower container and when hooking up the bottom cone 32 in the released position. The wire 39 between fastening

15 screw 31 and stop lug 46 has a length appropriate for this purpose.

20

In order to bring about a reliable return of the locking unit to the locking position after, in the course of turning, bottom cone 32 has, owing to the fact that its guide faces slide against the edges of the corner box hole, been guided down through the locking hole in the top corner box, or after the locking unit has been turned by actuating handle 37, at least some part of return spring 33 may be bent about locking unit shaft 35 so that the ends of the spring rest against retaining pin 42 and actively co-operate in a return of the locking unit to the normal locking position, at the same time as the spring legs 33 act in corresponding manner on lug 36 of the locking unit.

25

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When using the twist-lock according to Figures 9-11, first the upper straight locking cone 31 is fitted into the bottom corner box of an upper container, which is brought about by turning the lower locking cone 30 by hand against the action of spring 33 on lug 36, so that the upper locking cone can pass through the rectangular hole in the bottom corner box. When the lower locking cone 30 is released,

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the upper locking cone 31 is turned to the locking position by the action of spring 33 or lug 36, and the twist-lock is securely fastened in the bottom corner box of the upper container. The upper container is now lowered so that the "twisted" bottom cone 30 passes in through the top corner box of the lower container while the bottom cone 30 is turned through the contact between the oblique guide faces of the cone and the longitudinal side edges of the corner box. Once bottom cone 32 has passed through the corner box, it is turned by spring 33 to the locking position in the corner box. It should be noted that top cone 31 is turned, during the automatic turning in of the bottom cone in the corner box, in the locking direction in its own corner box, thus obviating any risk of the twist-lock being released from the corner box of the upper container.

Figure 11 shows the twist-lock from above in the locking position and it will be seen that top cone 31 indicated by fully-drawn lines and bottom cone 30 indicated by dashed lines are both in the locking position. Figure 11 also shows by dashed lines and schematically how the locking handle can be operated to release the lower locking cone 30 from the top corner box of a lower container and that the flexible handle can be hooked in anyone of the two positions into slot 47 or slot 48.

This can be brought about with the aid of a simple tool illustrated in Figure 12. The tool consists of a long rod 49 with an actuating hook 50 arranged at the end and a lever 51 secured to said hook, the lever extending at a substantially right angle in respect of rod 49 right opposite the free arm of hook 50. When operating handle 37 with a view to releasing the lower locking cone, hook 50 is hooked fast between the gripping section 43 and the top flange 44, and the rod is turned, whereby lever 51 is pressed against the support plate of the twist-lock, thus causing the handle to be pulled out while turning locking unit 30 and releasing the lower locking cone 30.

Figure 12 shows how stop lug 46 of the handle is secured on the outside of slot 47 (or 48) and maintains the twist-lock in the open position. The handle is released and the locking unit returned to the locking position in reverse manner.

In order to prevent excessive turning of the locking unit, the housing may be provided on the inside with a stop lug 52, against which fastening screw 41 abuts in the required end position, as shown in Figure 12.

5 The fact that the handle is flexible entails a number of advantages: the twist-lock withstands rough and careless handling without damage; the handle can be easily moved sideways, thus facilitating fastening of containers with the aid of fastening rods, which normally are connected close to the handle; it is simple to open
10 a twist-lock with the aid of the tool described, also at a height of several containers; direct indication is obtained as to whether the twist-lock is in the open or locking position; the twist-lock is, in simple manner, secured in the open position, etc.

15 It is understood that the above specification and the embodiments of the invention shown in the drawings are only of illustrative type, and that many modifications and variations are possible within the framework of the final claims.

Reference numbers

Figures 1-7:

- 1 housing
- 2 locking knob
- 3 turnable locking cone
- 4 handle
- 5 support plate
- 6 shaft section (2)
- 7 flange section (2)
- 8 locking pin
- 9 chamfered part
- 10 neck (1)
- 11 shaft (3)
- 12 flange
- 13 recess
- 14 herringbone tooth (3)
- 15 herringbone tooth (4)
- 16 shoulder (1)
- 17 conical head
- 17a contact faces (17)
- 18 lug
- 19 leaf spring
- 20 hole
- 21 O-line

Figure 8:

- 22 container
 - 23 twist-lock
 - 24 corner box
-

Figures 9-12:

- 25 housing (a and b)
- 26 screw
- 27 support blade
- 28 neck
- 29 neck
- 30 locking unit
- 31 top cone
- 32 bottom cone
- 33 spring
- 34 slot (in 25)
- 35 shaft (30)
- 36 lug
- 37 handle
- 38 hole (in 25)
- 39 wire
- 40 fastening screw
- 41 wire lock
- 42 fastening pin
- 43 gripping section (37)
- 44 stop flange (37)
- 45 shaft (37)
- 46 stop lug
- 47 slot
- 48 slot

Figure 12:

- 49 rod
 - 50 hook
 - 51 lever
 - 52 stop lug (in 25)
-

C l a i m s

1. Twist-lock for coupling together objects, e.g. a number of containers placed one above the other, which in known manner are provided with corner boxes with holes (24) for such twist-locks, said twist-lock consisting of a housing (1) with a locking knob (2) or a
5 cone (31) for primary, during the subsequent operation firm connection to a corner box in an object, e.g. a container, and a turnable locking cone (3) arranged at the opposite end for connection to a corner box of another object in a pair of objects, characterised in that the
10 turnable locking cone is subject to spring action (18,19) in the direction towards the locking position so that, once it has been passed through the hole of the corner box, it automatically assumes a locking position turned in relation to the hole, inasmuch as the
15 turnable locking cone (3) is designed with a head (17) of conical shape, the conical faces of which are twisted or oblique in such a way that when pressed against the hole of a corner box (24) the conical
head (17) is turned in such a way as to be capable of passing through the hole, whereafter it is turned, owing to its spring action, to the locking position, as soon as it has passed the hole.

2. Twist-lock according to claim 1 or claim 2, characterised in
20 that the turnable locking cone (3) is designed, in a circular section, with a lug (18) which is pressed by a leaf spring (19) with bistable action when passing a neutral position either in the direction towards the locking position or towards the open position.

3. Twist-lock according to claim 2, characterised in that lug
25 (18) of the locking cone which is acted upon by leaf spring (19) can, by the action of an operating handle (4), be pressed across a zero position to a locked position in which locking cone (3) assumes such a position that it can be inserted into the hole of a corner box and withdrawn therefrom without obstruction.

30 4. Twist-lock according to one of the preceding claims characterised in that the fixed locking knob (2) co-operates at at least one point with a locking pin (8) or similar device, which is arranged, after locking knob (2) has been inserted into the hole in a corner box and turned to the locking position, to drop down into the space

between the turned sides of locking knob (2) and the edges of the hole in the corner box, thus preventing turning back and inadvertent release of the twist-lock from the corner box (Figs. 1-7).

5 5. Twist-lock according to one of the preceding claims, characterised in that it is provided with an operating tool (4) which is connected to the turnable locking cone (3) and serves partly as an indicator for marking the position of the turnable locking cone (3) in relation to the twist-lock with the fixed locking knob (2), and partly as an actuating device for the locking cone (3) by causing, when
10 actuated, positive turning of the turnable cone by a certain angle (Figs. 1-7).

6. Twist-lock according to claim 5, characterised in that the turnable locking cone (3) and operating handle (4) are designed at least at one section of their co-operating surfaces within housing (1)
15 of the twist-lock with herringbone teeth (14, 15) producing a direct exertion of forces between the two parts (3, 4).

7. Twist-lock according to claim 1, characterised in that the housing (25) supports a through-going locking unit (30) with a protruding upper "straight" locking cone (31) and a protruding lower
20 "twisted" locking cone (32) as well as an intermediate shaft (35) to which lug (36) is secured, and in that the housing accommodates a substantially U-shaped, multi-layered leaf spring (33), the main section of which is secured within the housing and the legs of which abut each its side of lug (36), so that the locking unit can be
25 resiliently turned in both directions about a neutral position with locked cones (31, 32) (Fig. 9-11).

8. Twist-lock according to claim 7, characterised in that locking unit (30) can be positively turned, with the aid of a flexible handle (37) extending through a hole (38) in the housing and connected by
30 means of a flexible wire (39) of appropriate length to a protruding fastening pin (43) on shaft (35) of the locking unit until the twisted locking cone is released, and in that the housing is on the inside designed with a stop lug (52) in order to prevent excessive turning of locking unit (30).

35 9. Twist-lock according to claim 8, characterised in that the handle hole (38) in housing (25) opens out into at least one slot (47, 48) with a width closely identical with that of the flexible wire (39)

and in that handle (37) is of larger dimension and preferably designed with a stop lug (46) with the aid of which the "twisted" cone (32) can be secured in the release position by hooking up the handle with the stop lug (46) in one of slots (47,48), thus also providing a visual
5 indication of the fact that the twisted locking cone (32) is in the released position.

10. Twist-lock according to claims 7 and 8, characterised in that one leg of spring (33) is bent about the shaft (35) of a locking unit and is arranged to actuate on the fastening pin (43) of handle (37) so
10 as resiliently to press back locking unit (30) to its locking neutral position.

Fig. 1

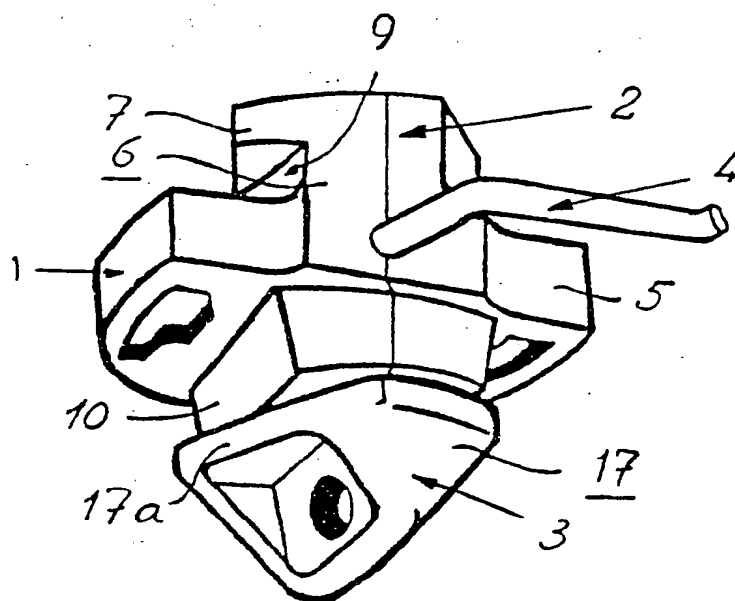


Fig. 2

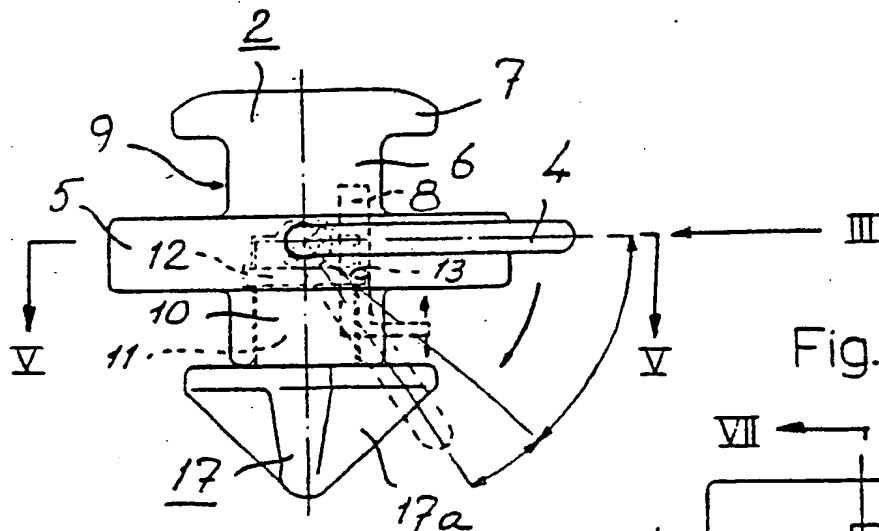


Fig. 3

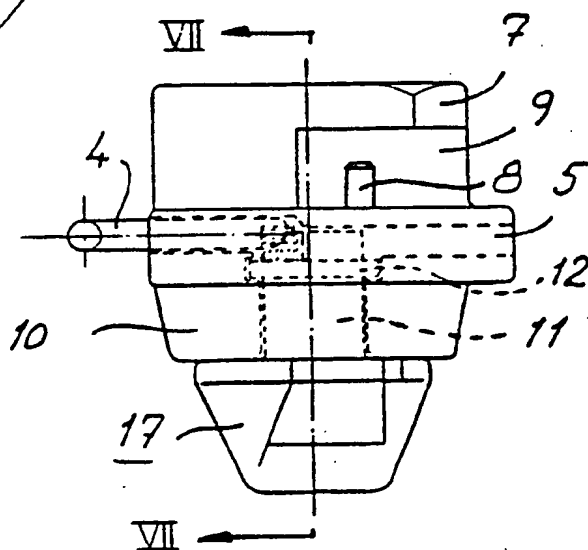


Fig. 4

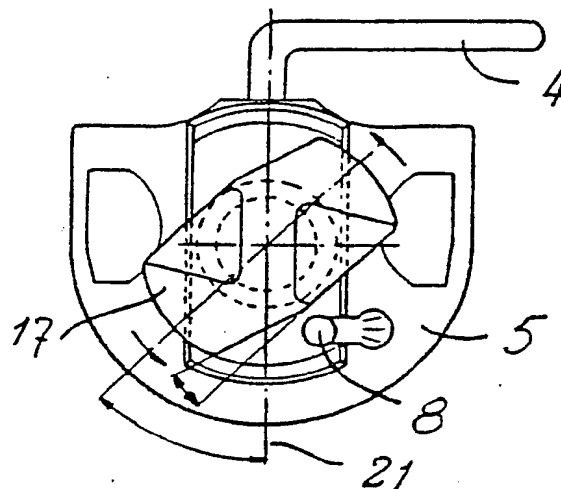


Fig. 5

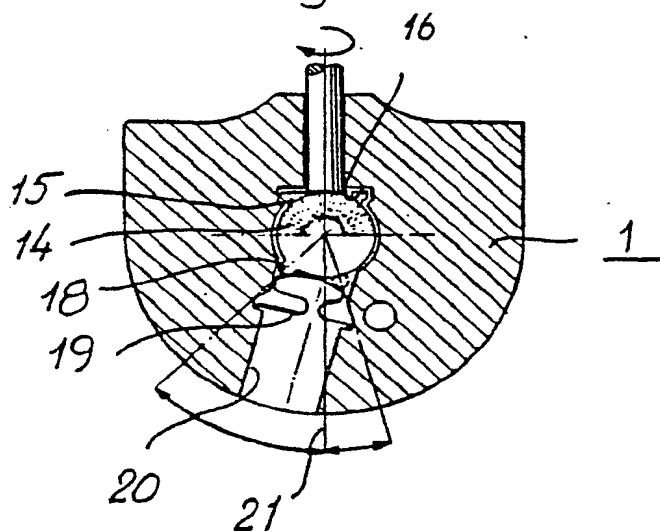


Fig. 6

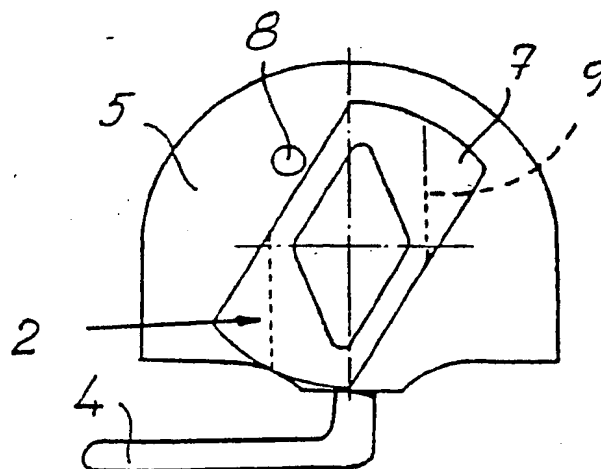


Fig. 7

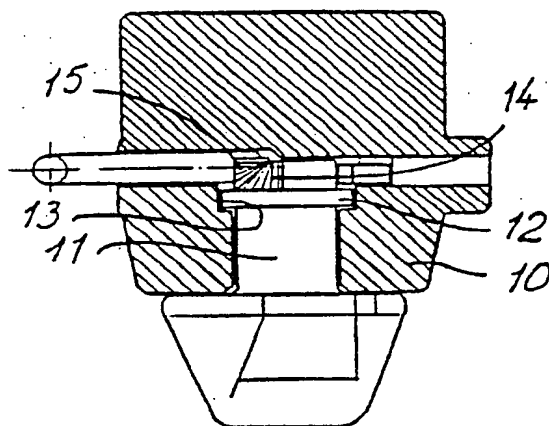


Fig. 8

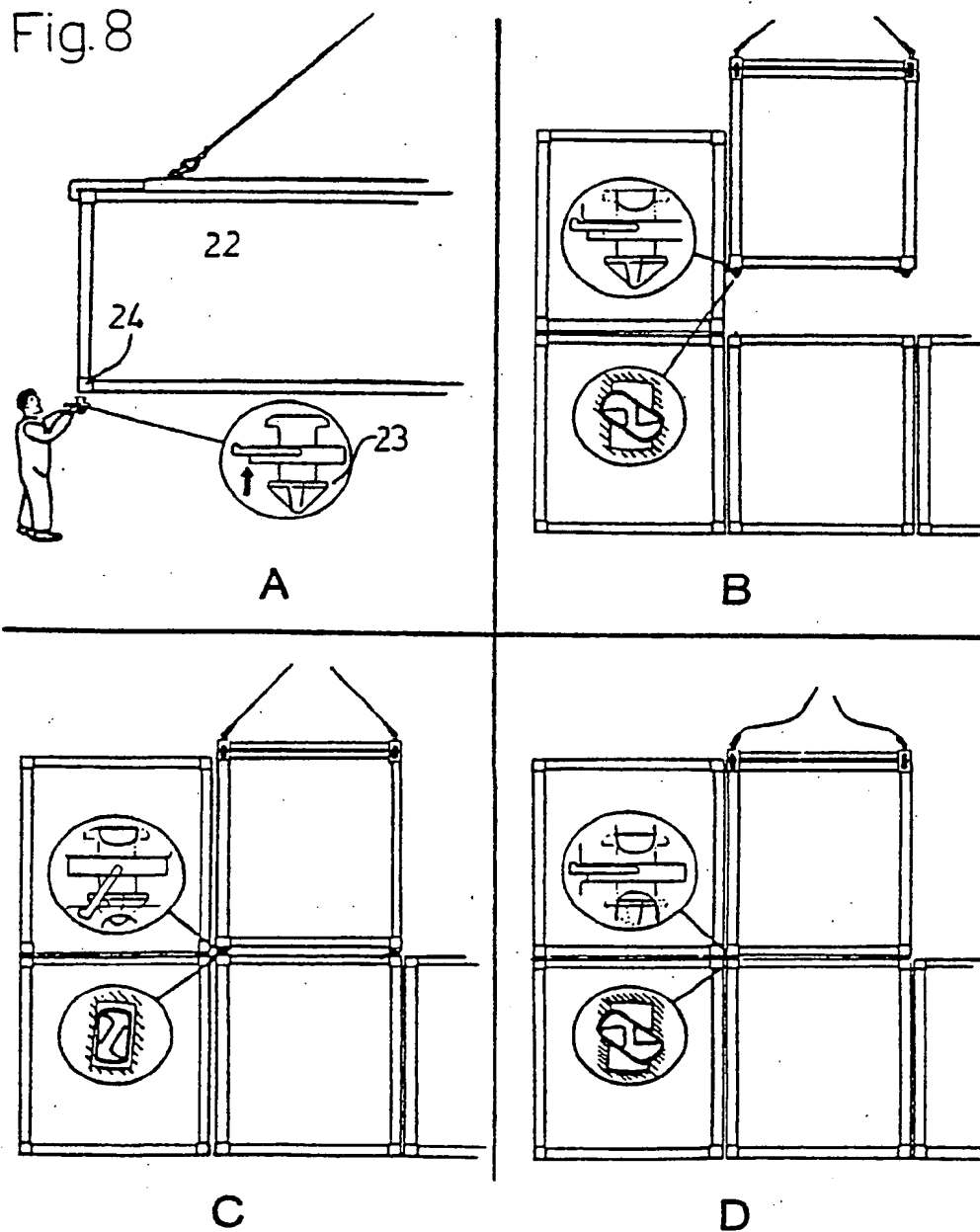


Fig. 9

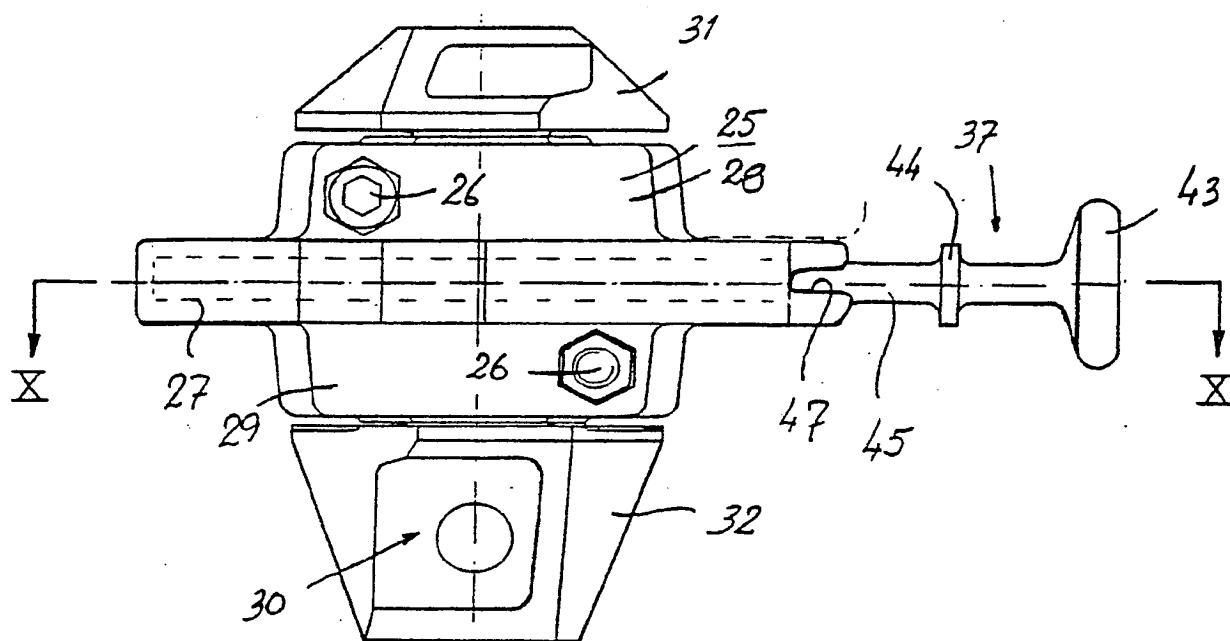


Fig. 10

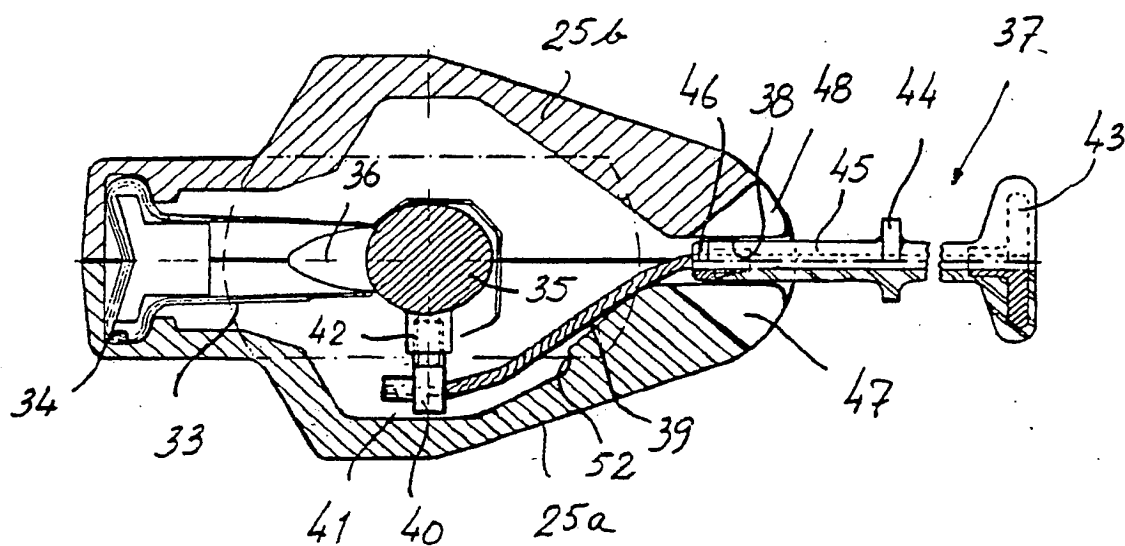


Fig. 11

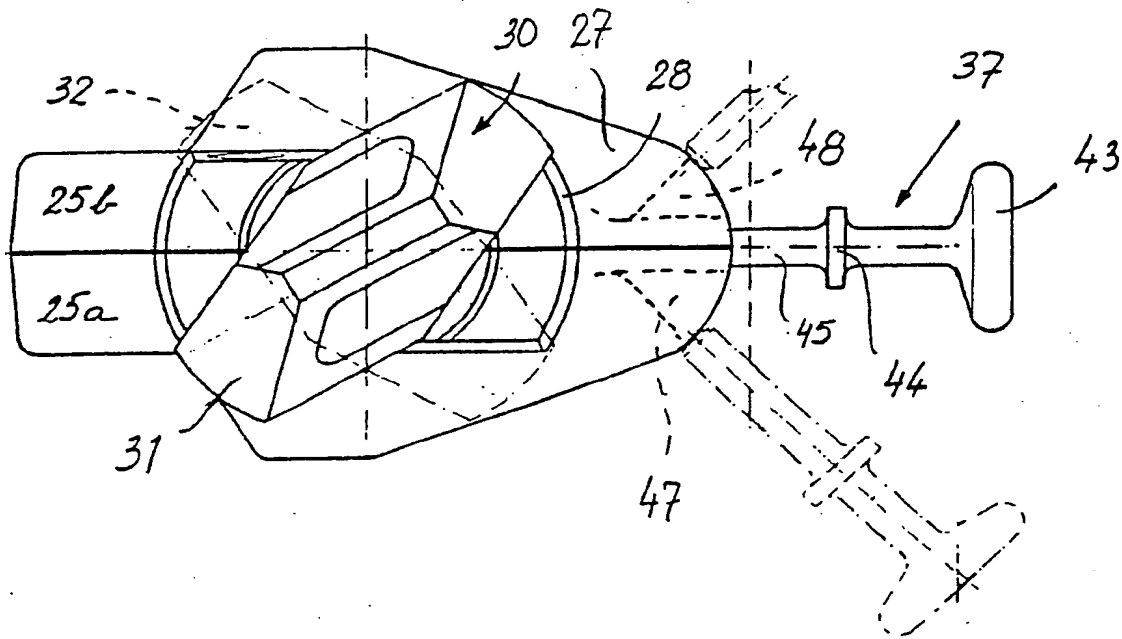
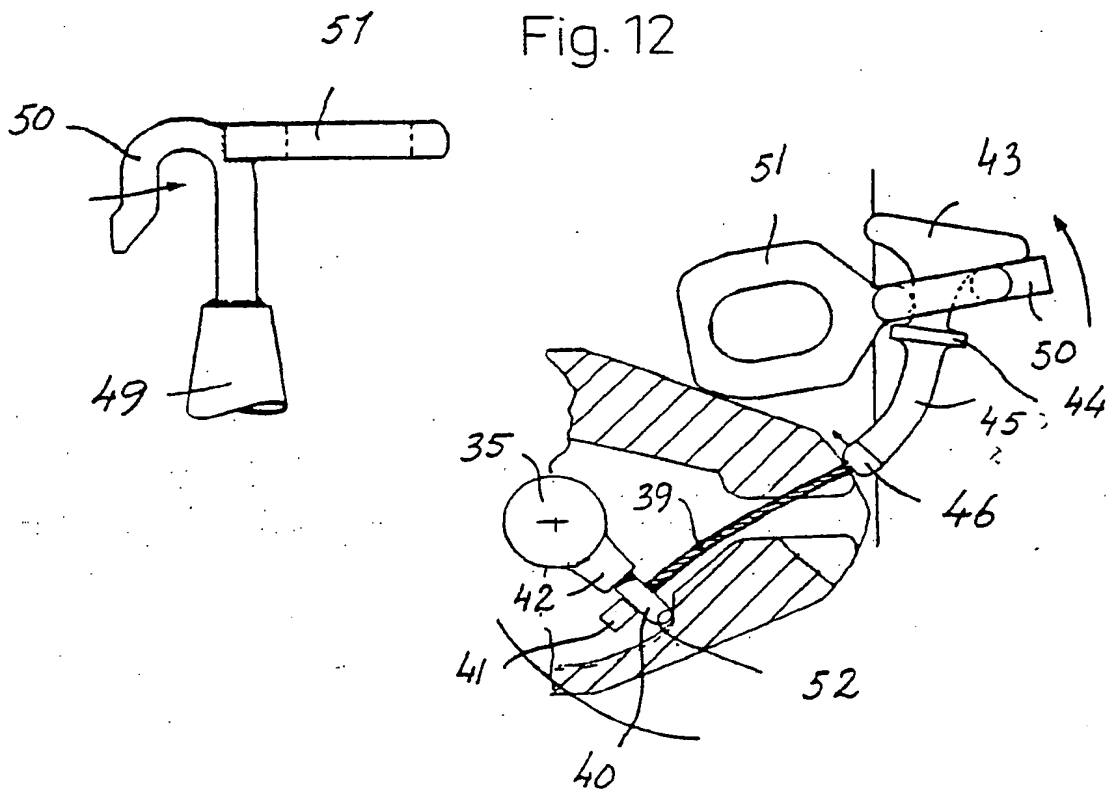
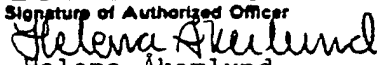


Fig. 12



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00132

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC 4		
B 65 D 21/02, B 63 B 25/22, B 60 P 7/13		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC 4	B 65 D 21/00, /02, 25/20, 90/00; B 63 B 25/22, /24; B 60 P 7/10, /13; B 65 J 1/22	
US C1	24:114, 287; 206:503; 220:1.5; 410:1-156	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched *		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
X	DE, A1, 3 538 892 (HIT INTERNATIONAL CORP) 15 May 1986 & JP, 61113587 SE, 8505199	1
X	Derwent's abstract No. G2364 E/21, SU 852 723	1
A	DE, A1, 3 439 134 (CONVER INGENIEUR-TECHNIK GMBH & CO KG) 7 May 1986	
A	DE, A1, 3 330 067 (TAIYO SEIKI IRON WORKS CO LTD) 29 November 1984	
A	DE, A1, 3 314 361 (WILLI WADER GMBH) 25 October 1984	
A	SE, B, 343 564 (AB BACKTEMANS PATENTER) 13 March 1972	
A	US, A, 4 196 673 (LOOKS) 8 April 1980	
.../...		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: **</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"A" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1988-06-13	1988 -06- 14	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	 Helena Åkerlund	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
E	WO, A, 88/03100 (JENSEN GUNNER VOLDGAARD) 5 May 1988	

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